Abstract No. He0456

Bulk Metallic Glass Gasket for High Pressure, *in situ* X-ray Diffraction

D. He, Y. Zhao, T. Sheng, R. Schwarz, J. Qian, L. Daemen (LANL), H. Mao, J. Hu, J. Shu, J. Xu (Geophysical Lab.)

Beamline(s): X17C

Introduction: Amorphous metallic alloys lack long-range atomic order and consequently exhibit excellent homogeneity, no microstructure discontinuities, and no sharp x-ray diffraction peaks [1]. Moreover they have higher tensile fracture strength and hardness than those of traditional crystalline metals [1]. These excellent physical properties make bulk metallic glasses very good candidates for high-pressure gaskets for *in situ* x-ray diffraction experiments.

Methods and Materials: A $Pd_{40}Ni_{40}P_{20}$ bulk metallic glass [2] was used as the gasket for DAC high pressure *in situ* x-ray diffraction experiments. The behavior of the $Pd_{40}Ni_{40}P_{20}$ amorphous alloy under hydrostatic/non-hydrostatic was investigated by *in situ* synchrotron x-ray diffraction. The pressure distribution of the amorphous metallic gasket in the DAC was measured by means of ruby fluorescence.

Results: We tested the $Pd_{40}Ni_{40}P_{20}$ amorphous alloy as a gasket material in three experiments. Because of their amorphous characteristic and excellent mechanical performance, bulk metallic glasses (BMG) can act as a very good gasket materials for DAC (or other gem anvil cell [3]) high pressure *in situ* x-ray diffraction experiments. For similar reasons the BMG gasket could also be used for high-pressure neutron diffraction experiments.

Acknowledgments: This work was performed under the auspices of the U.S. Department of Energy (DOE) under contract W-7405-ENG-36 with the University of California. The research project was supported with funds from the Los Alamos National Laboratory Directed Research and Development office and from the DOE Office of Industrial Technology (Advanced Materials for the Future).

References:

[1] A. Inoue, Acta. Mater.**48**, 279 (2000)
[2] T. D. Shen, Y. He, and R. B. Schwarz, J. Mater. Res. **14**, 2107 (1999)
[3] Ji-an Xu and Ho-kwang Mao, Science **290**, 783 (2000)